

METHOD OF PREPARATION OF COMPOSITIONS FOR AN AMALGAM

This invention relates to a method of preparing a dental amalgam that is devoid of harmful free mercury, to be used as a filler for dental cavities and in particular the invention relates to processes by which two separate compositions characterised as treated silver and silver-mercury compound are formed which are then used in a mixture with mercury to form the dental amalgam.

BACKGROUND OF THE INVENTION

Compositions for filling dental cavities presently available usually comprises of dental alloys mixed with mercury. The dental alloys include at least three metals. A typical alloy would include Silver, Tin and Copper. Small percentages of one or more additional metals like Zinc, Indium, Palladium and the like metals may be added. These dental alloys are available either in fine powder or as tablets (i.e. compressed powder). The dental alloy is mixed with mercury to form a putty or plastic mass known as amalgam which is packed into a tooth cavity as a filling. Among the three metals, namely Silver, Tin and Copper, Silver is the only metal used in dental alloys that can completely react with mercury to form a silver-mercury compound or silver amalgam.

Recently research scientists have established that there is "free" mercury i.e. unreacted mercury present within the amalgam fillings in the mouth. The free mercury can vapourise in the mouth from the fillings due to the higher temperatures experienced in the mouth. The mercury vapour can be inhaled into the lungs, where it is absorbed into the bloodstream. Studies have shown deposits of mercury in brain and kidney tissues that have originated from such fillings. Mercury also causes bleeding gums and skin reactions.

This "free" mercury has contributed to various medical problems as well as in certain patients, hypersensitivity reactions. In fact, in recent times, dental experts in Sweden have recommended to the authorities to ban the use of such "amalgams" in pregnant women to prevent genetic damage to the fetus as there is evidence to show that "free" mercury from the mother can via the transplacental route, affect the fetus.

A lesser problem in the use of conventional dental alloy amalgams is the chemical corrosion caused in the oral cavity. As tin and copper are prone to corrosion, the corrosion process continues in the mouth throughout the relatively short span of the life of the fillings.

In another aspect of the history of amalgam in dental fillings, silver fillings were mixed with mercury to form a putty which was filled into the tooth cavity. Unfortunately the mixed amalgam due to expansion property upon setting caused severe pain to the patient and protruded from the surface of the cavity and in bad cases even fractured the crowns of the teeth. In either case, the patient suffers severe pain, resulting in the extraction of the tooth. For this reason, silver in the original is not used alone with mercury to form the amalgam.

Tin is added to silver to make an alloy of silver and tin which alloy is then mixed with mercury to form the amalgam. Tin causes contraction on setting. This contraction can be offset by the expansion property in the purely silver-mercury amalgam. But the main disadvantage is that the mercury in the resultant amalgam contains unreacted mercury (in the free state) within the fillings.

To increase the strength of the amalgam filling varying percentage of copper was added to silver-tin alloy. Unfortunately the resultant amalgam still has mercury in the free state. As stated before, mercury vapour formation within the mouth can cause ill-effects to the patient.

Simply stated, for more that 150 years the search for a dental amalgam that is devoid of the toxic and harmful effect of free mercury has eluded researches.

SUMMARY OF THE INVENTION

Thus it is an object of the present invention to provide an amalgam for dental filling that substantially eliminates the problems elaborated above, in particular to provide an amalgam which is devoid of free mercury.

According to this invention, there is provided a method for the production of an amalgam for filling a dental cavity, which when used as an amalgam filling, is devoid of free mercury. The production of the compositions comprises of a process for preparing treated silver in a fine powder form and a process for the production of silver-mercury compound; the amalgam is produced by mixing the above two compositions with a recommended quantity of mercury, to produce the amalgam.

To obtain all the benefits of the invention it is desirable to use all the novel steps hereinafter described. Accordingly, the process of the invention comprises one or more of the following steps:

- (a) using as starting materials, metallic silver and tin of high purity to form a homogeneous alloy of silver and tin and then reducing the resultant alloy to a fine powder;
- (b) reacting the fine powder from (a) with hydrochloric acid to remove the tin and then siphoning off the Tin solution leaving behind undissolved solid particles and thereafter repeating the above reaction with fresh amount of hydrochloric acid until all the tin is removed and the appearance of the remaining solid particles changes from the original dark greyish colour to a yellowish-brown colour, which forms the composition referred to as the treated silver.
- (c) reacting advantageously metallic granules silver metal of high purity and mercury with nitric acid and thereafter precipitating silver-mercury from the resultant Nitrate solution of silver and mercury by adding copper of high purity then removing any traces of acid from the precipitate by filtering and washing the precipitate repeatedly with preferably warm water and drying the acid-free precipitate which forms the composition referred to as the silver-mercury compound.
- (d) mixing the treated silver from (b) with the silver-mercury precipitate from (c).
- (e) then mixing the composition from (d) with a recommended quantity of mercury to produce the final amalgam to be used for filling a tooth cavity.

By optimizing the various steps described above dental amalgam that is devoid of harmful free mercury is obtained.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred conditions for optimization through repeated experiments are described hereinafter.

- (a) By repeated experiments, Silver and Tin of high purity in the range of ratios between 60%:40% to 80%:20% by weight respectively were tried to form the alloy